Docket 16-239 NPRM (RM-11708) Ramifications for Amateur Radio

FCC Headquarters
Washington, DC
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Ad-Hoc Committee on Preservation of Narrowband Shortwave Amateur Radio Communication
CW Operators Club
NYU WIRELESS

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Agenda

- **Two big problems raised by RM-11708 and NPRM Docket 16-239**
- **Key issues for RM-11708 and NPRM Docket 16-239**
- **Existing amateur radio usage in HF/MF data/RTTY bands**
- **Need for bandwidth emission limit in HF/MF amateur radio**
- **Need for regulated band plan in HF/MF amateur radio**
- **Current ambiguity and national security risk for ARQ signaling**

The Two Big Problems

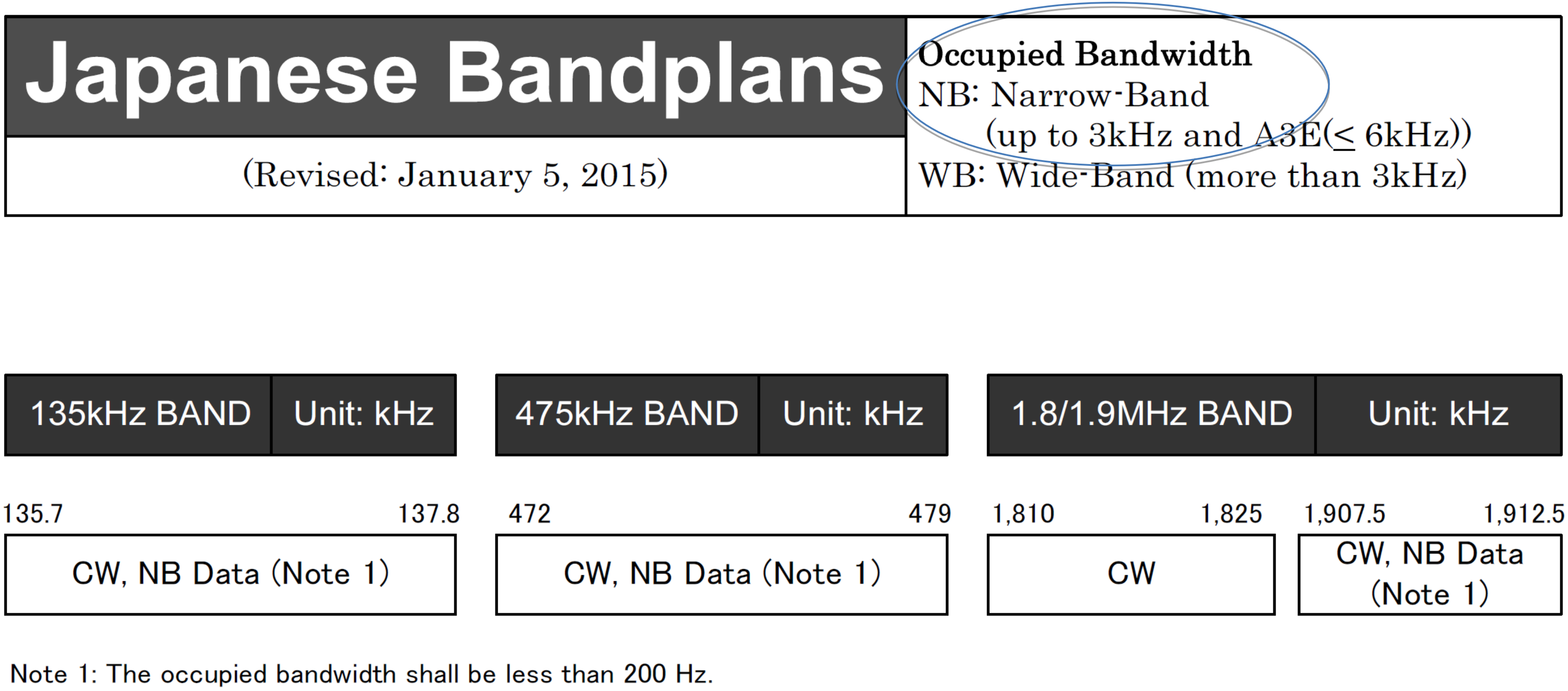
Problem 1:

Amateur HF/MF allocations are extremely small and travel long distances. HF/MF data users and applications are practically limited in bandwidth by the historic 300 baud limit (~400 Hz). Widening the bandwidth will cause interference and unintended uses in tiny allocation.

Problem 2:

Today's data users (Pactor 2-4, Winlink) are effectively *encrypted* w/ARQ. Part 97.309(a)(4) is unclear about the

How Japan solves one of the Big Problems



Japanese Bandplans

(Revised: January 5, 2015)

Occupied Bandwidth
NB: Narrow-Band
(up to 3kHz and A3E(≤ 6kHz))
WB: Wide-Band (more than 3kHz)

135kHz BAND	Unit: kHz
135.7	137.8
CW, NB Data (Note 1)	

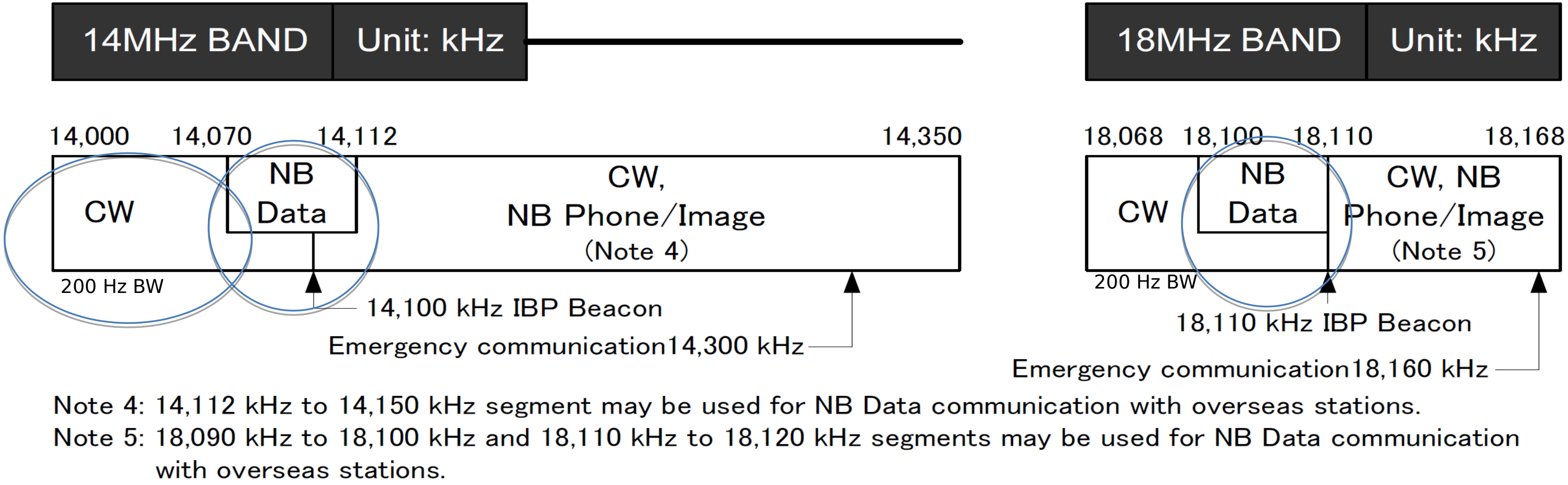
475kHz BAND	Unit: kHz
472	479
CW, NB Data (Note 1)	

1.8/1.9MHz BAND		Unit: kHz	
1,810	1,825	1,907.5	1,912.5
CW		CW, NB Data (Note 1)	

Note 1: The occupied bandwidth shall be less than 200 Hz.

Japan regulates by bandwidth, CW has 200 Hz bandwidth limit

How Japan solves one of the Big Problems



Note 4: 14,112 kHz to 14,150 kHz segment may be used for NB Data communication with overseas stations.

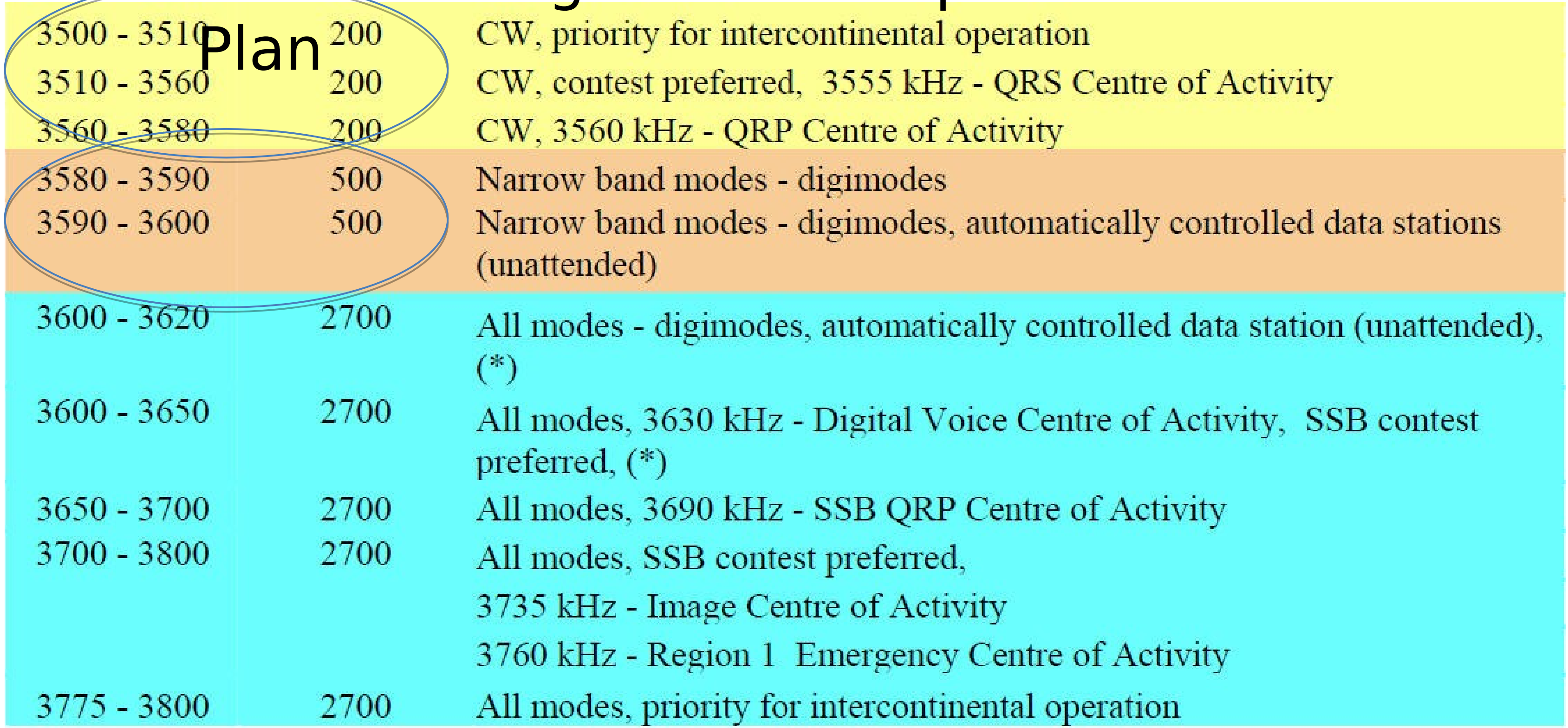
Note 5: 18,090 kHz to 18,100 kHz and 18,110 kHz to 18,120 kHz segments may be used for NB Data communication with overseas stations.

Japan regulates CW @ 200 Hz at low end, Phone < 3 kHz

Data is *between* CW 200 Hz (low end) and

How Europe solves one of the Big Problems

IARU Region 1 – Europe Band Plan



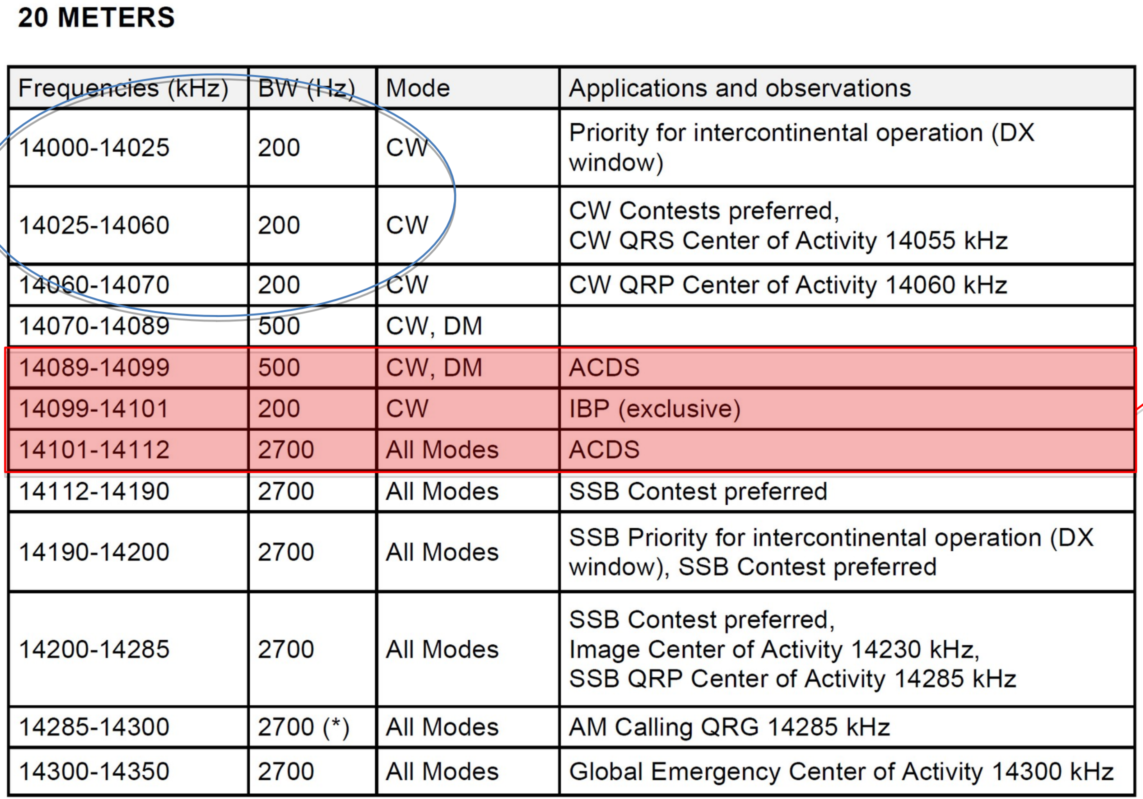
3500 - 3510	200	CW, priority for intercontinental operation
3510 - 3560	200	CW, contest preferred, 3555 kHz - QRS Centre of Activity
3560 - 3580	200	CW, 3560 kHz - QRP Centre of Activity
3580 - 3590	500	Narrow band modes - digimodes
3590 - 3600	500	Narrow band modes - digimodes, automatically controlled data stations (unattended)
3600 - 3620	2700	All modes - digimodes, automatically controlled data station (unattended), (*)
3600 - 3650	2700	All modes, 3630 kHz - Digital Voice Centre of Activity, SSB contest preferred, (*)
3650 - 3700	2700	All modes, 3690 kHz - SSB QRP Centre of Activity
3700 - 3800	2700	All modes, SSB contest preferred, 3735 kHz - Image Centre of Activity 3760 kHz - Region 1 Emergency Centre of Activity
3775 - 3800	2700	All modes, priority for intercontinental operation

IARU Region 1 http://www.iaru-r1.org/index.php?option=com_content&view=article&id=175&Itemid=127

How Americas solve one of the Big Problems

IARU Region 2 – Americas Band

P



20 METERS

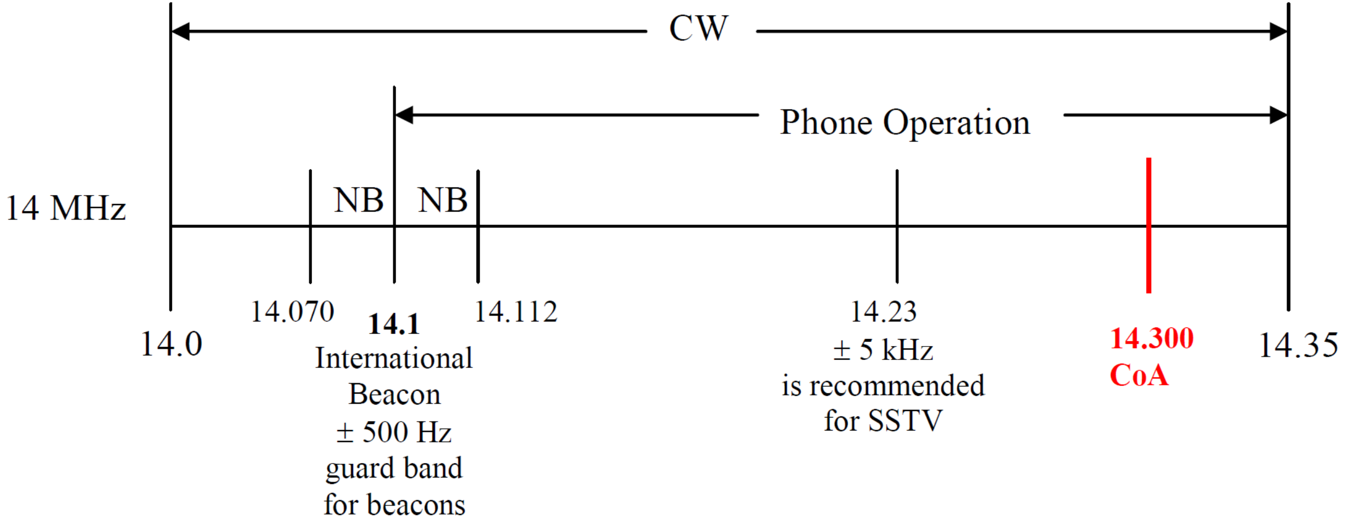
Frequencies (kHz)	BW (Hz)	Mode	Applications and observations
14000-14025	200	CW	Priority for intercontinental operation (DX window)
14025-14060	200	CW	CW Contests preferred, CW QRS Center of Activity 14055 kHz
14060-14070	200	CW	CW QRP Center of Activity 14060 kHz
14070-14089	500	CW, DM	
14089-14099	500	CW, DM	ACDS
14099-14101	200	CW	IBP (exclusive)
14101-14112	2700	All Modes	ACDS
14112-14190	2700	All Modes	SSB Contest preferred
14190-14200	2700	All Modes	SSB Priority for intercontinental operation (DX window), SSB Contest preferred
14200-14285	2700	All Modes	SSB Contest preferred, Image Center of Activity 14230 kHz, SSB QRP Center of Activity 14285 kHz
14285-14300	2700 (*)	All Modes	AM Calling QRG 14285 kHz
14300-14350	2700	All Modes	Global Emergency Center of Activity 14300 kHz

ACDS stations create problems today

IARU Region 2 http:// www.iaru-r2.org/documents/explorer/files/Plan%20de%20bandas%20%7C%20Band-plan/R2%20Band%20Plan%2020

How Asia solves one of the Big Problems

IARU Region 3 – Asia Band Plan


CW
Phone Operation
14 MHz
NB
NB
14.0
14.070
14.1
International Beacon ± 500 Hz guard band for beacons
14.112
14.23
± 5 kHz is recommended for SSTV
14.300
CoA
14.35

Note:

- ✓ Considering the dramatic increase in data mode usage on the 20 meter band, it is recommended that the sub-band for these classes of signals be 14.070 MHz to 14.112 MHz (with +/- 500 Hz at 14.100 MHz for beacons), and within that data sub-band the current practices of traditional data modes may continue up to 14.095 MHz with 14.095 to 14.112 MHz being reserved for other data modes including Packet.

IARU Region 3 http://www.radioamadores.org/biblio/iaru/R3-2015.pdf

RM-11708

- ARRL asks to remove 300 baud limit, add 2.8 kHz BW limit in **entire** data subbands
    - ~1822 unique commenters filed at FCC ECFS, 50/50 spilt for the proposal.
        - Proponents:
            - Modernize FCC rules with deregulation, simplicity
            - Alignment with some countries in Europe
            - Allows use of Pactor 4 and other higher rate data modes
            - Adds new use cases and appeal to amateur radio hobby
        - Opponents:
            - Massive Interference when replacing *300 baud* with *2.8 kHz* limit
                - Allows inharmonious signals: Japan and all IARU regulate
                - Destroys CW, RTTY, Narrowband experimentation if 2.8 kHz bandwidth is allowed over the *entire* subbands

https://www.fcc.gov/ecfs/search/filings?proceedings_name=RM-11708&sort=date_disseminated,DESC

RM-11708

- Ballot stuffing was very evident in the first month after publication of RM 11708 in November 2013
  - 130 identical comments were filed by proponents of RM 11708 in the first 30 days– appear to be machine generated with time stamps that are very close together. https://ecfsapi.fcc.gov/file/60001039573.pdf
  - FCC has a precedent for explicitly discounting “pre-packaged statements” see Order for NPRM-11392, Footnote 7: https://apps.fcc.gov/edocs_public/attachmatch/DA-08-1082A1.pdf
  - The amateur radio community “woke up” to RM 11708 after the ARRL visited FCC officials in Spring 2014.
  - Comments now are overwhelmingly **against** RM-11708, ~85% unique comments since March 17, 2014 are against RM-11708, citing interference, encryption/lack of intercept, illegal activity, and

NPRM Docket 16-239

FCC proposes and seeks comments regarding:

- removal of 300 baud limit (Para. 8)
- no bandwidth limitation (Para. 12)

- **~100 comments filed at ECFS, 89% against the FCC NPRM**
  - Vast majority of commenters **cite the need for a bandwidth limit**
    - BW limit needed to protect narrowband users (CW/RTTY/JT65, etc.)
    - Japan uses regulated band plan to protect 200 Hz/ 500Hz users
    - IARU in all 3 regions urges narrowband limit (200 Hz/ 500 Hz)
  - Many **cite problems w/ encryption vs. compression** wideband modems
    - Pactor 1 was decipherable, but not Pactor 2-4 in ARQ mode
    - Most worry future modes will engulf tiny HF/MF amateur

http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0728/FCC-16-96A1.pdf https://www.fcc.gov/ecfs/search/filings?limit=25&offset=0&proceedings_name=16-239&sort=date_disseminated,DESC

Existing HF/MF Amateur Radio Data Usage

- 720,000 licensed US amateur radio operators, 2nd behind Japan
  - In HF/MF bands, vast majority operate CW, RTTY, JT65, PSK31, JT9, SSB
    - FCC respects/protects legacy modes (97.3(c)5, 97.305, 97.307)
    - FCC avoids allocating sub bands to inharmonious users (NPRM)
    - In 1990s, FCC 97.221 allowed ACDS data, increased bandwidth to greater than 500 Hz in small allocated HF bands (violations today)
    - FCC requires published or other codes (97.309)
    - FCC requires no business use (97.113(a)(2)(3)
    - FCC requires no bypass of commercial business (97.113(a)(5))
    - Approximate number of US users in HF/MF data/RTTY subbands
      - ~150,000 use Morse Code, RTTY, Narrowband data

https://ecfsapi.fcc.gov/file/7521098786.pdf
https://ecfsapi.fcc.gov/file/1092095307697/Objection%20to%20RM-11708.pdf
https://ecfsapi.fcc.gov/file/109151227915014/McVey_Comments_RM11708RM.pdf , https://

Need for Bandwidth Emission Limit

- Both RM-11708 and Docket 16-239 (NPRM) have a bandwidth problem:
  - Vast number of amateurs use 200 Hz bandwidth (CW, JT9, PSK31, etc.)
  - Smaller number of amateurs use 500 Hz bandwidth (JT65, RTTY)
  - Very small minority of amateurs use > 500 Hz bandwidth (ACDS,97.221)
  - **Many** generally accepted standards PROHIBIT bandwidths >200 Hz/500Hz
  - Para. 12 of NPRM seeks council. Evidence shows **narrowband protections**!

  - Inharmonious transmissions occur with 2.8 kHz bandwidth limit (ARRL)
    - 2.8 kHz same bandwidth as SSB and is >> 200 Hz or 500 Hz

Need for Regulated Band Plan in Part 97

- Regulated Band Plan is required to mitigate interference with data expansion.
- Many “generally accepted standards” (NPRM Para. 12) for regulated band plan
- If it removes 300 baud limit, FCC needs to make new “wideband data” subband above CW/RTTY and below Phone/Image subband like Japan and all IARUs

- Japanese band plan– applied by Japanese regulators
- http://www.jarl.org/English/6_Band_Plan/JapaneseAmateurBandplans20150105.pdf

- IARU Region 1 (EU) – adopted by many regulators and European governments
- http://www.iaru-r1.org/index.php?option=com_content&view=article&id=175&Itemid=127

- IARU region 2 (NA/SA) – adopted by many South American governments
- http://

Current ambiguity and encryption problems

- Relatively few US amateurs use WinLink and Pactor data signaling
- Few amateurs operate HF Automatically Controlled Digital Stations (ACDS)
  - Pactor is a radio modulation used by mariners and amateur operators
    - Pactor I: FSK (200 baud, 300 Hz BW)
    - Pactor II: 2 Tone DPSK (200 baud,1.2 kbps, 500 Hz BW)
    - Pactor III 18 Tone DQPSK (200 baud, 2.7 kbps, 2.2 kHz BW)
    - Pactor IV: 32 QAM (1800 baud, 5.5 kbps, 2.4 kHz) www.sigidwiki.com
- Winlink is an amateur radio network (connects internet to radios)
- Winmor is a modulation and signaling protocol (500, 1600 Hz)
- RMS Express is an email application that runs with Pactor, Winmor
- RMS Express is on the web, provides radio message server information
- Pactor I: only documented Pactor, AMTOR/SITOR without

Current ambiguity and encryption problems

- Pactor II, Pactor III, Pactor IV are *effectively encrypted* when in ARQ operation combined with unpublished compression and channel fading. Not open!

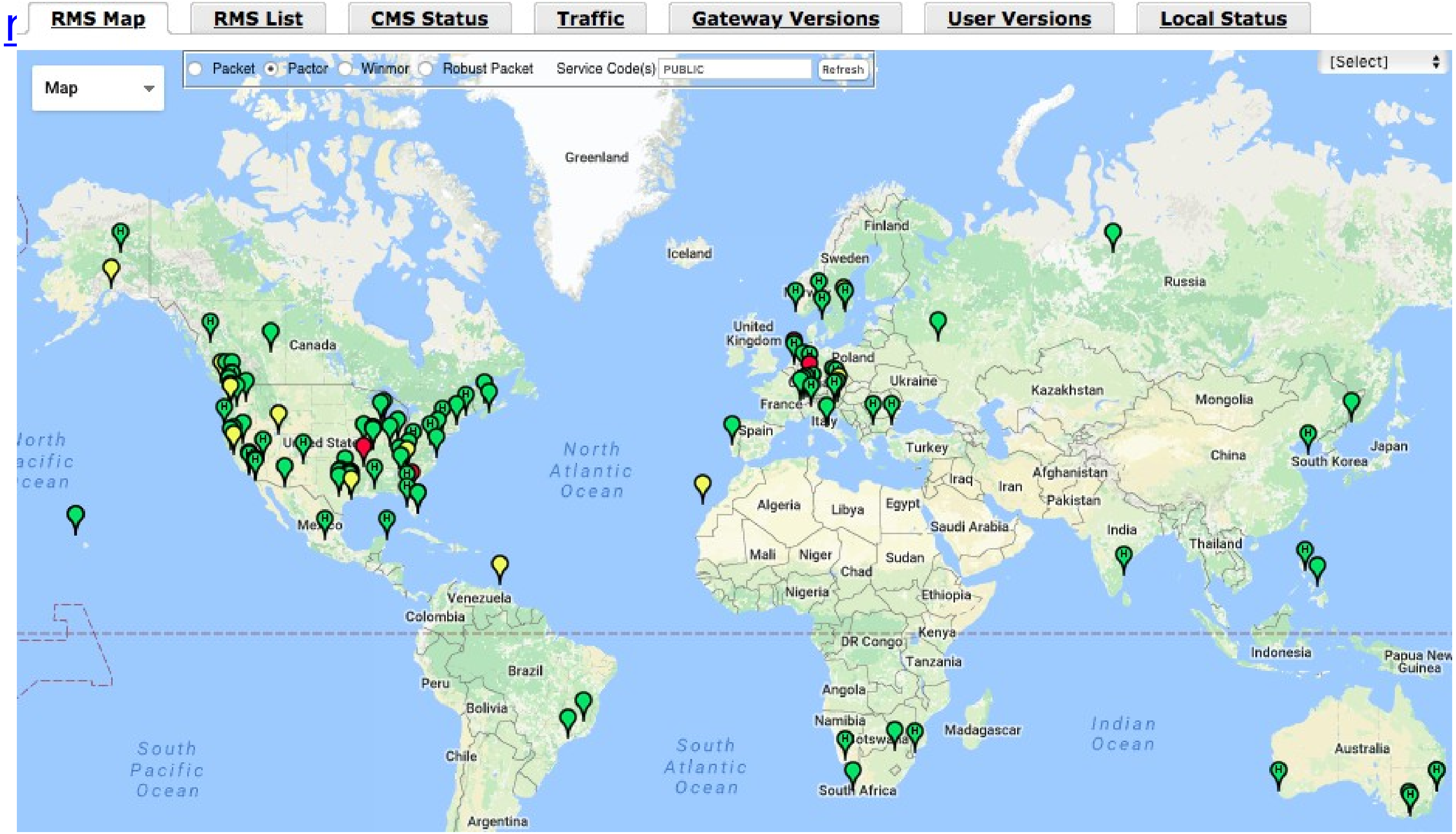
- Winlink exploits "Security by Obscurity" and interprets Part 97 rules as allowing private compression. *FCC does not clearly state that signals must be able to be monitored by others*. **Clarification of 97.309(a)(4) needed: "technical characteristics have been documented publicly" does *not* apply to compression in Pactor II, III, IV since it is private and amateurs are not able to listen – communication is not open and is effectively encrypted. Part 97.307(f)(14) unfortunately shows Pactor III, mean Pactor I?**

- Unless you are in direct connection with an SCS modem in ARQ, transmissions are effectively encrypted. **Self-policing is not possible.** Call signs are transmitted using FEC (Pactor I HW/SW decodes FEC ID: Riley Hollingsworth). **CW ID regulation and "listen before talk" rules would help ensure all amateurs can identify ACDS transmissions.**

- Amateurs are generally not using Pactor III for "calling CQ" or hobby activity in

Current ambiguity and encryption problems

- Map of HF RMS gateway stations, Pactor: [www.winlink.org/r]()



○ Packet ● Pactor ○ Winmor ○ Robust Packet

Service Code(s) PUBLIC

Winlink violations and FCC enforcement issues

- Winlink RMS Express channel list shows many FCC violations (see handouts):

“Security by Obscurity”: Winlink messages are obscured, violation of Part 97.113, but amateurs exploit confusion in 97.309(a)(4), but “**PacTOR” is only Pactor I**.
Part 97.307(f)(14) has unfortunate error showing Pactor III example**, Pactor III is not documented**. Secure communication without eavesdropping is accomplished.

- Handout shows violations of Part 97.221(b)(c) (many commenters: Leslie,Gedes)
  - Violations show ACDS stations are out of their spectrum allocation
  - Violations show ACDS stations are using > 500 Hz bandwidth
  - These violations cause a great deal of interference to narrowband stations

Winlink violations and FCC enforcement issues

- Further example of possible violations and enforcement problems (handout)

  - See many ECFS filings seeking maritime internet: Violation of 97.113(a)(5)
  - Commenters wish to bypass commercial internet such as Satellite, SailMail.

  - Amateurs are using Winlink for pecuniary interest: Violation of 97.113(a)(3)

  - Today’s ambiguous rules (97.309(a)(4)) fosters **lack of intercept–** FCC should clarify rule if it wishes for “open” reception for “self-policing” of amateur radio

  - The above problems must be addressed before removal of 300 baud limit.

  - Opening BW floodgates would create major interference, enforcement

Possible FCC actions on NPRM

- Proceed with NPRM Docket 16-239 as published – this ignores 89% of commenters and places amateur radio on a dangerous path with wideband interference and encrypted internet service on HF. **Not recommended.**

- Proceed with ARRL proposal – this ignores 89% of commenters who seek FCC regulation by bandwidth in the narrowband parts of the data subbands, and places amateur radio on a dangerous path to wideband commercial and encrypted internet service in HF/MF. **Not recommended.**

- Adopt regulations to limit bandwidth emissions, provide narrowband (200 Hz/ 500 Hz) segments in the lower part of all HF/MF bands (like IARUs and Japan) without ACDS stations. Create new wideband data segment with 2.8 kHz bandwidth in “mid-range” of each band. **Must be done concurrently with rule clarifications to ensure**

Conclusion

- RM-11708 and Docket 16-239 ignore a fundamental law that narrowband signals cannot operate in the face of wideband signals.

- RM-11708 was “greedy” in asking for **entire subband** for each HF/MF band to host data signals as wide as SSB signals. That has never been allowed, and would create inharmonious transmissions and vast interference. The wider 2.8 kHz bandwidth creates much larger interference than today’s hobby-like 300 baud signaling (200-500 Hz). See IARUs and Japan. Instead, regulation should have 200/500 Hz BW in low end and offer new 2.8 kHz BW subband.

- FCC’s NPRM poses even more of an interference threat with unspecified BW, with greater security risk given the encrypted nature of current data traffic and out-of-band violations.

- The ARRL and FCC have ignored the encryption problem, now the hobby is unable to self-police today’s data stations or the spectrum use. This must be fixed before removing 300 baud limit. FCC should clarify rules to ensure self-policing of the hobby **before** expanding data.

Thank You!

Questions